July 22, 2013

Studley, Inc. and
555 13th Street, NW
Suite 420 E
Washington, DC 20004

U.S. Department of Veterans Affairs

Attn: Ms. Samantha R. Kurtz
Project Associate
P: (202) 624 8504
F: (202) 624 8555
E: SKurtz@studley.com

Re: Geotechnical Engineering Letter Report (Report)
Proposed National Veterans Burial Grounds
Laurel, Montana
Terracon Project No. 26135019

Dear Ms. Kurtz:

Reliance

The contracting party (Client) for this work and report has been Studley, Inc. However, it is understood that the U.S. Department of Veterans Affairs (VA) also is granted reliance to this Report and that they also would be subject to the terms, limitations, restrictions and caveats expressed in this Report and the Agreement for Services. The VA understands that this Report reflects the opinions of Terracon as of the date of the Report. No person or entity other than Studley, Inc. and the VA may rely upon the Report. Hereinafter, where the phrase "Studley, Inc." occurs, it is to be understood as "Studley, Inc. and the VA."

Introduction

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above-referenced project. This study was performed in general accordance with our proposal number D2612285 dated December 7, 2012 and your authorization to proceed provided on April 11, 2013. This letter report presents the results of the geotechnical engineering services performed for the proposed project.

Project Information

Based on the information provided, the project consists of future development for new burial grounds. A preliminary site plan of the existing property was given to Terracon by Studley, Inc. Requested boring locations were also provided on this preliminary site plan.

The purpose of our services was to reasonably characterize and evaluate the subsurface soil and groundwater conditions, and to provide general earthwork recommendations.

Field Exploration

As requested, a total of ten (10) borings were drilled for the project on April 25th and 26th, 2013 to approximate depths of 10.5 feet below existing grades at the locations requested by Studley, Inc. The boring locations are shown on the Boring Location Diagram included at the end of this letter report.

The borings were advanced using a truck-mounted CME 55 drilling rig, equipped with solid stem augers. The borings were located in the field by personnel from Terracon measuring from site features. Estimated ground elevations were obtained from Google Earth Pro. The locations and elevations of the borings should be considered accurate only to the degree implied by the means and methods used to define it.

Our field engineer recorded a log of the borings during the drilling operations. At selected intervals, samples of the subsurface materials were taken by driving split-spoon samplers and collecting auger cuttings.

Penetration resistance measurements were obtained by driving the split-spoon into the subsurface materials with a 140-pound automatic hammer falling 30 inches. The penetration resistance value is a useful index in estimating the relative density, or consistency, of the materials encountered. A measurement for groundwater was made upon completion of each boring.

Laboratory Testing

The samples obtained in the field were visually classified and were tested for the following properties in our lab:

- Visual Classifications
- Grain Size Distribution
- Moisture Content
- Liquid and Plastic Limits

Laboratory tests were conducted on the selected samples for classification and the results are presented on the attached exhibits. The test results were used for the geotechnical engineering analyses and the development of the recommendations.

Subsurface Soil and Groundwater Conditions

Underlying a layer of vegetation, the subsurface profile generally consists of sandy lean clay with gravel overlying either lean clay, silty sand or gravels. Layers of gravel with fine-grained soils were encountered in Borings BH-4, BH-5, BH-6 and BH-10 at typical depths ranging between 4 and 7.5 feet below the ground surface. Silty sand layers were encountered in

Borings BH-7 and BH-9 at typical depths of 8 to 10 feet below the existing grade. The soil conditions are presented on the Boring Logs included at the end of this letter report.

The clay soils generally had Standard Penetration Test (SPT) N-values in the range of 4 to 59 blows per foot with values typically less than 18. The occasional high N-value in the fine-grained soils is a result of the gravels encountered in the soil profile. These N-values indicate the clay to be variably medium stiff to very stiff in consistency, have moderate compressibility and low to moderate shear strength characteristics. SPT N-values in the sands and gravels ranged from about 29 to 50+ blows per foot which indicates these materials to be medium dense to very dense in relative density, have relatively low compressibility and moderate to high shear strength characteristics.

Detailed conditions encountered at the boring locations are indicated on the individual logs found at the end of this report. Stratification boundaries on the logs represent the approximate location of changes in soil and rock materials; in situ, the transition between materials may be gradual.

Groundwater was not encountered in the borings drilled for this project. This observation represents groundwater conditions at the time of the field exploration and may not be indicative of other times, or at other locations. Groundwater can be expected to fluctuate with varying seasonal and weather conditions. Evaluation of the factors that affect groundwater fluctuations is beyond the scope of this letter report. For a more detailed description of the subsurface conditions, please see the boring logs provided at the end of this letter report.

Geotechnical Conditions and Recommendations

Earthwork Considerations - Existing vegetation, debris (if encountered), and any other deleterious materials should be removed from proposed excavation areas. Stripped materials consisting of vegetation and organic materials should be wasted from the site, or salvaged as possible resources for landscaping elements.

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment such as tractor mounted backhoes and tracked excavators. The excavated site soils, cleaned of all organic/deleterious material, may be stockpiled on-site and re-used as fill or for landscaping purposes. Engineered Fill (fill materials placed in a controlled manner) should be placed in 8-inch lifts in loose thickness and compacted to 95% of the maximum dry density (Standard Proctor D698) with moisture contents within ±3 percent of optimum.

Although the exposed subgrade is anticipated to be relatively stable upon initial exposure, unstable subgrade conditions could develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive or excessive construction traffic. The use of light, rubber tracked construction equipment would aid in reducing subgrade disturbance. Should unstable subgrade conditions develop, stabilization measures may need to be employed.

Chemical and Organic Properties – As requested, Terracon has obtained chemical and organic properties of the site soils from a report provided by Peaks to Plains dated March 6, 2008. This report presents the chemical testing performed on the site soils collected at the burial grounds. The test results are summarized below:

Physical Properties:

- pH: 7.4
- Conductivity: 4,240 umhos/cm
- Solids, Total Dissolved – Calculated: 3,260 mg/L

Inorganics:

- Alkalinity, Total as $CaCO_3$: 179 mg/L
- Bicarbonate as HCO_3: 218 mg/L
- Carbonate as CO_3: Not Detected
- Chloride: 79 mg/L
- Sulfate: 2,050 mg/L
- Hardness as $CaCO_3$: 1,260 mg/L
- Hardness as $CaCO_3$ – Grains: 73.8 grains/gal
- Sodium Adsorption Ratio (SAR): 6.95

Metals:

- Nitrogen: 2.82 mg/L
- Calcium: 252 mg/L
- Iron: Not Detected
- Magnesium: 154 mg/L
- Potassium: 7 mg/L
- Sodium: 568 mg/L

Sulfate in water values from 1,500 to 10,000 are considered to have severe attack potential on normal strength concrete. As a result, Type V Portland cement should be specified for project concrete placed on and below grade. If Type V cement is not available, concrete using Type I-II cement with documented sulfate resistance may be used. Foundation concrete should be designed in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 4.

The Seismic Site Classification for this project site is Class D. This classification is in general accordance with the 2009 International Building Code (IBC). Site class definitions are based on the average properties in the top 100 feet of the subsurface profile. The current scope requested for this project does not include the required 100-foot soil profile determination.

Closing

We appreciate the opportunity to provide this service. Please contact us with any questions or for further information regarding our analysis and for any additional geotechnical engineering services.

Sincerely,
TERRACON

Gary W. Rome, P.E..
Principal/Office Manager-Billings, MT

Matt Geering, P.E.
Geotechnical Department Manager

Reviewed by: Walt Feeger, P.E.
Office Manager – Rapid City, SD

Enclosures
cc: 3 - Client
1 – File

Project Mngr:	MG
Drawn By:	AF
Checked By:	GR
Approved By:	MG

Project No.	26135019
Scale:	AS-SHOWN
File No.	
Date:	May 2013

Terracon
Consulting Engineers and Scientists
2110 Overland Avenue, Ste 124 Billings, MT 59102
PH. (406) 656-3072 FAX. (406) 656-3578

BORING LOCATION DIAGRAM

Proposed National Veterans Burial Grounds
Laurel North Road
Laurel, Montana

FIG. No.

1

BORING LOG NO. BH- 1

PROJECT: Proposed National Veterans Burial Grounds

CLIENT: Studley, Inc.

SITE: 55 Buffalo Trail Road
Laurel, Montana

LOCATION

Latitude: 45.697° Longitude: -108.7735°

Approximate Surface Elev: 3497 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	LITHOLOGY
0.5	3496.5+/-	**TOPSOIL**, brown, w/ vegetation and organics
10.5	3486.5+/-	**SANDY LEAN CLAY WITH GRAVEL (CL)**, medium plasticity, brown, stiff to very stiff, varying amounts of fine to coarse gravel
		Boring Terminated at 10.5 Feet

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (Ft.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		1	2-3-6 N=9	19			
		0.9	4-5-7 N=12	12		33-15-18	63
5		1.2	8-14-28 N=42	5			
		0.8	11-7-7 N=14	16			
10		0.6	3-16-10 N=26	11			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" flight auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
2110 Overland Ave., Suite 124
Billings, Montana

Boring Started: 4/25/2013 Boring Completed: 4/25/2013

Drill Rig: CME 55 Driller: T. Miller

Project No.: 26135019

BORING LOG NO. BH- 2

PROJECT: Proposed National Veterans Burial Grounds

CLIENT: Studley, Inc.

SITE: 55 Buffalo Trail Road
Laurel, Montana

LOCATION

Latitude: 45.697° Longitude: -108.7731°

Approximate Surface Elev: 3495 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DESCRIPTION
0.5	3494.5+/-	**TOPSOIL**, trace gravel, brown, w/ vegetation and organics
5.0	3490+/-	**SANDY LEAN CLAY WITH GRAVEL (CL)**, brown, very stiff
10.5	3484.5+/-	**LEAN CLAY WITH SAND (CL)**, trace gravel, brown, stiff
		Boring Terminated at 10.5 Feet

DEPTH (Ft.)	RECOVERY (Ft.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.8	4-11-48 N=59	8			
	0.3	8-13-9 N=22	7			
5	0.5	14-5-5 N=10	16			
	1.1	4-5-7 N=12	16			
10	0.8	4-4-7 N=11	14			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" flight auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
2110 Overland Ave., Suite 124
Billings, Montana

Boring Started: 4/25/2013 Boring Completed: 4/25/2013

Drill Rig: CME 55 Driller: T. Miller

Project No.: 26135019

BORING LOG NO. BH- 3

PROJECT: Proposed National Veterans Burial Grounds

CLIENT: Studley, Inc.

SITE: 55 Buffalo Trail Road
Laurel, Montana

LOCATION

Latitude: 45.697° Longitude: -108.7722°

Approximate Surface Elev: 3487 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	GRAPHIC LOG	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Ft.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3486.5+/-		**TOPSOIL**, brown, w/ vegetation and organics									
0.7			**SANDY LEAN CLAY WITH GRAVEL (CL)**, brown, very stiff				1.1	3-13-12 N=25	15			
							0.8	6-7-7 N=14	17			
				5			0.6	7-3-4 N=7	14			
							0.7	7-4-4 N=8	14			
9.0	3478+/-		**LEAN CLAY WITH SAND (CL)**, trace gravel, medium plasticity, brown, stiff to very stiff	10			1.2	3-5-8 N=13	14		40-14-26	81
10.5	3476.5+/-		***Boring Terminated at 10.5 Feet***									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" flight auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
2110 Overland Ave., Suite 124
Billings, Montana

Boring Started: 4/25/2013 Boring Completed: 4/25/2013

Drill Rig: CME 55 Driller: T. Miller

Project No.: 26135019

BORING LOG NO. BH- 4

PROJECT: Proposed National Veterans Burial Grounds

CLIENT: Studley, Inc.

SITE: 55 Buffalo Trail Road
Laurel, Montana

LOCATION

Latitude: 45.6967° Longitude: -108.7731°

Approximate Surface Elev: 3491 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Ft.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		TOPSOIL, trace gravel, brown, w/ vegetation and organics									
1.0	3490+/-					1.2	3-6-6 N=12	15			
		SANDY LEAN CLAY WITH GRAVEL (CL), brown, medium stiff, varying amounts of gravel									
						0.4	4-2-2 N=4	14			
			5			1.1	2-2-2 N=4	15			
						1.3	15-16-18 N=34	5			
			10			1.1	5-9-10 N=19	5			
10.5	3480.5+/-										
		Boring Terminated at 10.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" flight auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
2110 Overland Ave., Suite 124
Billings, Montana

Boring Started: 4/25/2013 Boring Completed: 4/25/2013

Drill Rig: CME 55 Driller: T. Miller

Project No.: 26135019

BORING LOG NO. BH- 5

PROJECT: Proposed National Veterans Burial Grounds

CLIENT: Studley, Inc.

SITE: 55 Buffalo Trail Road
Laurel, Montana

LOCATION

Latitude: 45.6967° Longitude: -108.7723°

Approximate Surface Elev: 3488 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description
0.5	3487.5+/-	**TOPSOIL**, brown, w/ vegetation and organics
2.5	3485.5+/-	**SANDY LEAN CLAY (CL)**, brown, very stiff
4.0	3484+/-	**SANDY LEAN CLAY WITH GRAVEL (CL)**, brown, stiff
7.0	3481+/-	**POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM)**, trace clay, brown, medium dense
10.5	3477.5+/-	**SANDY LEAN CLAY WITH GRAVEL (CL)**, brown, stiff
		Boring Terminated at 10.5 Feet

DEPTH (Ft.)	RECOVERY (Ft.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.9	3-7-10 N=17	21			
	0.9	3-6-6 N=12	8			
5	1.1	11-14-15 N=29	4			
	1	5-5-4 N=9	15			
10	0.9	2-3-4 N=7	13			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" flight auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
2110 Overland Ave., Suite 124
Billings, Montana

Boring Started: 4/25/2013 Boring Completed: 4/25/2013

Drill Rig: CME 55 Driller: T. Miller

Project No.: 26135019

BORING LOG NO. BH- 6

PROJECT: Proposed National Veterans Burial Grounds

CLIENT: Studley, Inc.

SITE: 55 Buffalo Trail Road
Laurel, Montana

LOCATION

Latitude: 45.6962° Longitude: -108.772°

Approximate Surface Elev: 3485 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DESCRIPTION
0.4	3484.5+/-	**TOPSOIL**, brown, w/ vegetation and organics
7.5	3477.5+/-	**SANDY LEAN CLAY WITH GRAVEL (CL)**, brown, very stiff
10.5	3474.5+/-	**POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM)**, fine to coarse grained, brown, dense
		Boring Terminated at 10.5 Feet

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Ft.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			1	4-9-9 N=18	10			
			0.7	7-10-7 N=17	13			
5			0.6	5-16-21 N=37	13			
			1	8-12-21 N=33	4			
10			0.6	17-20-13 N=33	5			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" flight auger

Abandonment Method:
Borings backfilled with cement-bentonite grout upon completion.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
2110 Overland Ave., Suite 124
Billings, Montana

Boring Started: 4/25/2013 Boring Completed: 4/25/2013

Drill Rig: CME 55 Driller: T. Miller

Project No.: 26135019

BORING LOG NO. BH- 7

PROJECT: Proposed National Veterans Burial Grounds

CLIENT: Studley, Inc.

SITE: 55 Buffalo Trail Road
Laurel, Montana

LOCATION

Latitude: 45.6961° Longitude: -108.7731°

Approximate Surface Elev: 3487 (Ft.) +/-

DEPTH		ELEVATION (Ft.)
0.3	**TOPSOIL**, brown, w/ vegetation and organics	3486.5+/-
	SANDY LEAN CLAY WITH GRAVEL (CL), brown, medium stiff to stiff	
8.0		3479+/-
	SILTY SAND (SM), trace gravel, brown, medium dense	
10.1		3477+/-
10.5	**LEAN CLAY WITH SAND (CL)**, brown, stiff	3476.5+/-
	Boring Terminated at 10.5 Feet	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Ft.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			1.1	4-8-8 N=16	15			
			0.5	2-2-3 N=5	17			
5			1.1	4-4-6 N=10	14			
			1.3	9-6-4 N=10	6 9		NP	34
10			1.5	7-4-7 N=11	8 16			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" flight auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
2110 Overland Ave., Suite 124
Billings, Montana

Boring Started: 4/25/2013 Boring Completed: 4/25/2013

Drill Rig: CME 55 Driller: T. Miller

Project No.: 26135019

BORING LOG NO. BH- 8

PROJECT: Proposed National Veterans Burial Grounds

CLIENT: Studley, Inc.

SITE: 55 Buffalo Trail Road
Laurel, Montana

LOCATION

Latitude: 45.6958° Longitude: -108.7723°

Approximate Surface Elev: 3485 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Ft.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.4	3484.5+/-										
TOPSOIL, brown, w/ vegetation and organics											
SANDY LEAN CLAY WITH GRAVEL (CL), brown, stiff to very stiff, w/ very thin silt seams at 7.5 feet						0.8	4-14-13 N=27	17			
						0.3	15-27-16 N=43	15			
			5			0.9	6-7-11 N=18	13			
						1	3-5-4 N=9	11			
9.0	3476+/-										
LEAN CLAY WITH SAND (CL), brown, stiff			10			1	3-4-5 N=9	16			
10.5	3474.5+/-										
Boring Terminated at 10.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" flight auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
2110 Overland Ave., Suite 124
Billings, Montana

Boring Started: 4/26/2013 Boring Completed: 4/26/2013

Drill Rig: CME 55 Driller: T. Miller

Project No.: 26135019

BORING LOG NO. BH- 9

PROJECT: Proposed National Veterans Burial Grounds

CLIENT: Studley, Inc.

SITE: 55 Buffalo Trail Road
Laurel, Montana

LOCATION

Latitude: 45.6955° Longitude: -108.7718°

Approximate Surface Elev: 3481 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DESCRIPTION
0.3	3480.5+/-	**TOPSOIL**, w/ vegetation and organics
		SANDY LEAN CLAY WITH GRAVEL (CL), medium plasticity, brown to gray, weak odor, medium stiff to stiff
9.0	3472+/-	
		LEAN CLAY WITH SAND (CL), brown, stiff to very stiff
10.0	3471+/-	
10.5	3470.5+/-	**SILTY SAND (SM)**, trace gravel, brown, medium dense
		Boring Terminated at 10.5 Feet

DEPTH (Ft.)	RECOVERY (Ft.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.9	1-2-2 N=4	5			
	1.2	3-2-3 N=5	17		38-16-22	59
5	1	1-2-4 N=6	23			
	0.3	16-24-16 N=40	20			
10	1.2	4-5-22 N=27	8			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" flight auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
2110 Overland Ave., Suite 124
Billings, Montana

Boring Started: 4/26/2013 Boring Completed: 4/26/2013

Drill Rig: CME 55 Driller: T. Miller

Project No.: 26135019

BORING LOG NO. BH-10

PROJECT: Proposed National Veterans Burial Grounds

CLIENT: Studley, Inc.

SITE: 55 Buffalo Trail Road
Laurel, Montana

LOCATION

Latitude: 45.6952° Longitude: -108.7723°

Approximate Surface Elev: 3487 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DESCRIPTION
0.8	3486+/-	**TOPSOIL**, brown, w/ vegetation and organics
5.0	3482+/-	**SANDY LEAN CLAY WITH GRAVEL (CL)**, brown, stiff to very stiff
9.7	3477.5+/-	**POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM)**, trace clay, coarse grained, brown, very dense
		Boring Terminated at 9.7 Feet

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Ft.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			0.8	4-8-8 N=16	14			
			0.8	4-7-5 N=12	15			
5			0.8	4-15-12 N=27	12			
			0.7	12-21-50/4" N=50/4"	4			20
			0	22-50/2" N=50/2"				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" flight auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
2110 Overland Ave., Suite 124
Billings, Montana

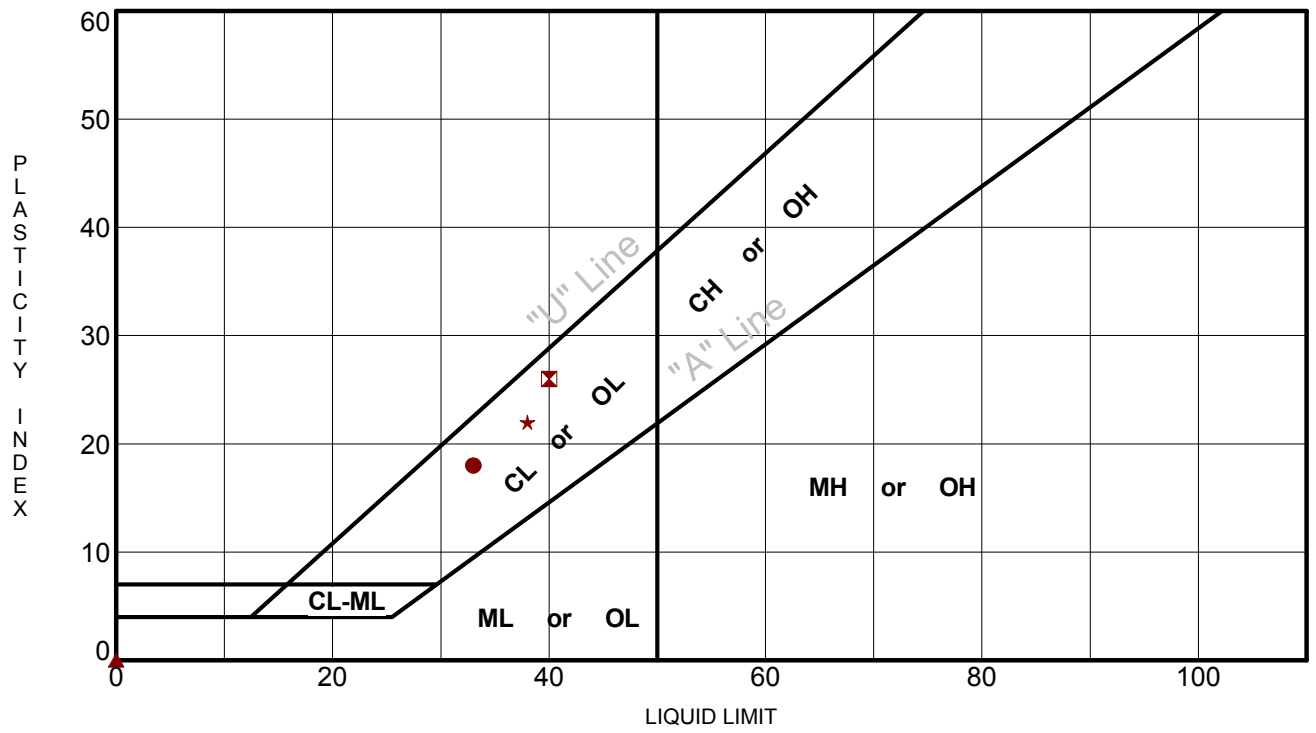
Boring Started: 4/26/2013 Boring Completed: 4/26/2013

Drill Rig: CME 55 Driller: T. Miller

Project No.: 26135019

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
● BH- 1	2.5	33	15	18	63	CL	SANDY LEAN CLAY with GRAVEL
⊠ BH- 3	9.0	40	14	26	81	CL	LEAN CLAY with SAND
▲ BH- 7	8.0	NP	NP	NP	34	SM	SILTY SAND
★ BH- 9	2.5	38	16	22	59	CL	SANDY LEAN CLAY with GRAVEL

PROJECT: Proposed National Veterans Burial Grounds

SITE: 55 Buffalo Trail Road
Laurel, Montana

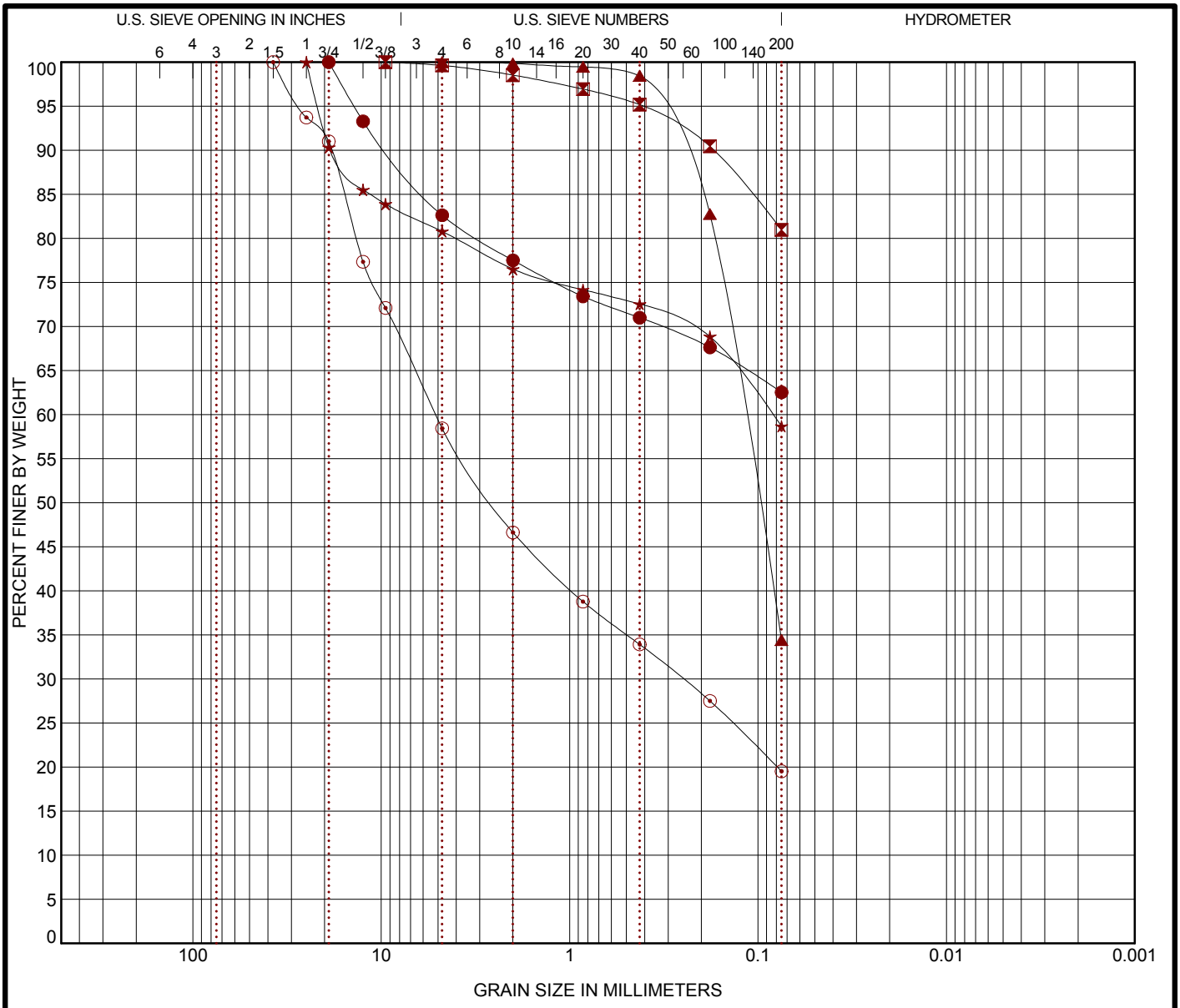
Terracon
2110 Overland Ave., Suite 124
Billings, Montana

PROJECT NUMBER: 26135019

CLIENT: Studley, Inc.

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification	LL	PL	PI	Cc	Cu
●	BH- 1	2.5	SANDY LEAN CLAY with GRAVEL(CL)	33	15	18		
⊠	BH- 3	9.0	LEAN CLAY with SAND(CL)	40	14	26		
▲	BH- 7	8.0	SILTY SAND(SM)	NP	NP	NP		
★	BH- 9	2.5	SANDY LEAN CLAY with GRAVEL(CL)	38	16	22		
⊙	BH-10	7.5						

Boring ID		Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BH- 1	2.5	19				17.4	20.1	62.5	
⊠	BH- 3	9.0	9.5				0.4	18.7	81.0	
▲	BH- 7	8.0	4.75	0.119			0.0	65.6	34.4	
★	BH- 9	2.5	25	0.084			19.2	22.1	58.7	
⊙	BH-10	7.5	37.5	5.141	0.251		41.6	38.9	19.5	

PROJECT: Proposed National Veterans Burial Grounds

SITE: 55 Buffalo Trail Road
Laurel, Montana

Terracon
2110 Overland Ave., Suite 124
Billings, Montana

PROJECT NUMBER: 26135019

CLIENT: Studley, Inc.

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 26135019 BURIAL GROUNDS.GPJ TERRACON2012.GDT 5/16/13